

JOINT INTEROPERABILITY:
FOG OR LENS FOR JOINT VISION 2010?

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Preface

The issue of joint interoperability has become more a target for policy and doctrinal reform in recent years. As an air command and control officer, my experiences with lack of joint interoperability of datalinks, voice communications and general procedures have been numerous since the very start of my military career.

My interest in this topic as an area of research was peaked by my participation as a member of a Marine air control agency in the All Service Combat Identification Evaluation Team evaluation (ASCIET) in 1995. ASCIET is an organization chartered by the Joint Requirements Oversight Council (JROC) to conduct annual joint evaluations of combat identification to develop and refine tactics, techniques, procedures, and technology to prevent fratricide in ground-to-ground, air-to-ground, surface-to-air, and air-to-air engagements. During the many months of planning and in the actual conduct of the exercise, it became apparent that joint interoperability problems still plague US forces. Often these interoperability problems were the cause of the problem ASCIET was created to root out—fratricide. These problems were highlighted at ASCIET 95 on numerous occasions.

While these interoperability problems were usually the result of incompatible command and control or communications systems, they were compounded by a lack of understanding and awareness on the part of one service participant with respect to another. Through the intensive planning and execution effort of ASCIET 95 (and other

similar joint exercises), I have come to appreciate the invaluable contribution to interoperability gained by simply talking and working through problems with members of other services. Teamwork between dedicated service members is the critical ingredient of quality people highlighted in the Chairman's *Joint Vision 2010*.

The author acknowledges the assistance provided by the ASCIET staff, especially Major Mike Molidor, Lieutenant Colonel Mike Davis and Mr. Brandon Wilson. Additionally, I thank Mr. Mark Moskopf supporting the Navy Program Executive Office for Theater Air Defense. Finally, the professionalism and research expertise of Major Tony Hardin was indispensable in the preparation of this report.

Abstract

Within and outside the military establishment, it's a well known fact interoperability problems hurt readiness and , in extreme cases, cause the needless loss of lives. Since the Goldwater-Nichols Act of 1986, US forces have been committed to joint operations. Operation Desert Storm continued to point out interoperability problems among the US services and coalition partners. Since Desert Storm, a number of efforts have been initiated to solve these problems and increase the effectiveness of joint warfighting including *C4I for the Warrior* and, most notably and recently, *Joint Vision 2010*. This project advances the proposition that the military has neither adequately addressed the C2 interoperability problems associated with Desert Storm nor planned for the major C2 considerations to adequately implement *Joint Vision 2010*.

Through the review of primary (source documents and interviews), secondary, and tertiary sources, this project, starting with the interoperability problems encountered in Desert Storm, examines the current state of US forces' interoperability using *Joint Vision 2010* as a criterion. Existing or potential interoperability problems that may be encountered in each of the vision's four operational concepts (Dominant Maneuver, Precision Engagement, Focused Logistics, and Full-Dimension Protection) are examined. Finally, based on the findings, the project will include appropriate recommendations.

Chapter 1

Introduction

The nature of modern warfare demands that we fight as a joint team. This was important yesterday, it is essential today, and it will be even more imperative tomorrow.

—John M. Shalikashvili

The history of warfare, in particular the relatively short history of the United States at war, has shown the decisiveness of joint warfare. The intervention of French naval support to Washington's Revolutionary Army,¹ the Union riverine operations in the Civil War, Pacific island-hopping and European invasion in World War II, Inchon in Korea, and Desert Storm² all demonstrate the imperative of joint operations to military success. The ability of the land, sea, air and space forces to integrate and interoperate to achieve a combined arms effect was the key in these instances. Joint interoperability is becoming more significant and will be the decisive factor in 21st century warfare as described in *Joint Vision 2010*.

Thesis Statement and Significance of the Problem

Joint Vision 2010 (JV 2010) is "the conceptual template...to achieve new levels of effectiveness in joint warfighting."³ *JV 2010* challenges the US military to reach new levels of joint integration and interoperability. Despite considerable progress, primarily as a

result of the Goldwater-Nichols Act, the US military has neither adequately addressed the command and control (C2) interoperability problems associated with Desert Storm nor planned for the major C2 considerations to adequately implement *JV 2010*.

Interoperability among joint and combined forces is arguably the singular key element in this increased effectiveness. Interoperability problems hurt readiness and, in extreme cases, cause the needless loss of lives through failed opportunities at enemy attrition or fratricide. As the tempo and lethality of warfare and the complexity of military operations other than war has increased, the importance of interoperability has grown. Modern warfare has become information warfare, which has both facilitated and complicated the interoperability problem. As Senator Nunn states:

The United States will never send forces from just a single military service to major combat in the future. All future combat operations will combine the capabilities of each of the military departments under the joint combatant commanders. Technical and procedural interoperability in command and control has become a real imperative. Modern communications and computer technology, if properly managed, can help to bridge the interoperability gap. However, this gap will surely widen if we fail to emphasize interoperability in managing our investment in modern command and control systems.⁴

While interoperability can cover a host of areas, it is in the area of C2, the exchange of information and orders, that it is most critical. General Wickham points out that “if solid jointness does not exist in the [command, control and communication and intelligence] (C3I) area, then jointness in other areas of military capability is largely irrelevant because forces will not be able to optimize their capabilities or operate together effectively.”⁵

JV 2010 calls for greater interoperability to squeeze “every ounce of capability”⁶ from available resources and forces. To achieve this greater joint capability will require a “more

seamless integration of service capabilities. To achieve this integration while conducting military operations, we must be fully joint: institutionally, organizationally, intellectually, and technically.”⁷ The vision extends this requirement to “find[ing] the most effective methods for integrating and improving interoperability with allied and coalition partners.”⁸

The Goldwater-Nichols Act of 1986, marked a re-commitment of US forces to joint operations. Operation Desert Storm continued to highlight interoperability problems among the US services and coalition partners. Since Desert Storm, a number of efforts have been initiated to solve these problems and increase the effectiveness of joint warfighting including C4I for the Warrior (C4IFTW) and, most notably and recently, *JV 2010*. Considering *JV 2010* the desired end state or measure of effectiveness for joint interoperability, an analysis of interoperability deficiencies from Desert Storm through today will generate recommendation for improvements.

Limitations of the Study

The subject of interoperability is a broad and constantly evolving area for research. This study is limited in time and scope to concentrating on the interoperability implications in Goldwater-Nichols through Desert Storm and, finally, *JV 2010*. *JV 2010* itself is a broad-based conceptual document with a host of implications for the future integration of joint warfare. This study will be directly and indirectly focused and influenced by the joint operational experiences of interoperability shortfalls experienced by the author.

Definitions and Assumptions

Interoperability

While precisely defined below by the Chairman of the Joint Chiefs of Staff (CJCS) instruction (CJCSI), interoperability, as an achievable state for forces or systems of varying services or nations, is not as quantifiable as the definition suggests. Therefore, the definition requires amplification and qualification from various perspectives.

The CJCS official definition of interoperability is:

The ability of the systems, units, or forces to provide services to and accept services from other systems, units, or forces, and to use the services so exchanged to enable them to operate effectively together. The conditions achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users.⁹

This definition encompasses both the broad requirement for forces to work effectively together, along with the more narrow prerequisite condition for their C2 systems to interoperate.

Compatibility and Integration

This definition of interoperability can be seen as a midpoint in a hierarchy extending from compatibility, “the capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference,”¹⁰ to integration, “the arrangement of systems in an architecture so that they function together in an efficient and logical way.”¹¹ As forces or systems progress on this hierarchy, they progress from mere peaceful coexistence and non-interference, to the exchange of information and services for effective operations, finally, to an ordered,

planned arrangement into an architecture. This analysis will assess US forces' progress on this hierarchy.

In the official CJCSI definition of interoperability given above, it is important that the measure of success is defined by the operator or warfighter and in terms of mission accomplishment. Brigadier General Mallion argues that the emphasis be on the interoperability of the *forces* in exchanging mission significant *services* to achieve the operator's expectation of *operating effectively* together.¹²

Assumptions

This study makes the assumption, potentially a large one, that the basic roles and function of the services and US Special Operations Command (USSOCCOM) as currently defined will remain, despite some adjustments in force structure and specific capabilities that may result from the Quadrennial Defense Review (QDR).

Additionally, this study assimilates the basic assumptions of *JV 2010*. These are discussed in its introduction as follows:

1. The primary task of military will be to deter and win wars, based on a strategy of power projection facilitated by overseas presence.
2. The military will maintain sufficient high quality personnel to accomplish its assigned tasks.
3. The military will maintain sufficient first-rate, technologically superior equipment.
4. The US military will continue to operate in a joint and multinational environment.
5. Advances in technology including long-range precision strike capability, a wider range of effects from weapons, low-observable and stealth, and information systems will continue to transform modern warfare.¹³

Preview of the Argument

Chapter One presents a theoretical and historical background for interoperability by first examining general causes for noninteroperability. Then the history of US interoperability development is traced from the Goldwater-Nichols Act to the post-Gulf War efforts of C4IFTW. Finally, recurring interoperability problems remaining from Desert Storm today are highlighted. Chapter Two discusses the interoperability implications of the operational concepts of *JV 2010* and the interoperability disconnects between the supporting service visions. Chapter Three presents recommendations and highlights programs to achieve the greater levels of interoperability, i.e. integration required for *JV 2010*.

Notes

¹ Russel F. Weigley, *American Way of War*, (Bloomington, In: Indiana University Press, 1973), 40.

² Joint Publication 1, *Joint Warfare of the Armed Forces of the United States*, January 1995, II-2, III-3, IV-3, II-7, i.

³ Chairman of the Joint Chiefs of Staff, *Joint Vision 2010*, (Washington, DC: US Dept of Defense, 1996), 1.

⁴ Senator Sam Nunn, "Forward," in *Control of Joint Forces: A New Perspective*, ed. LtGen Clarence E. McKnight (Fairfax, Va: AFCEA International Press, October 1989), vii.

⁵ John A. Wickham, "Jointness and Defense Decision Making," in *Control of Joint Forces: A New Perspective*, ed. LtGen Clarence E. McKnight (Fairfax, Va: AFCEA International Press, October 1989), 112.

⁶ *Joint Vision 2010*, 8.

⁷ *Ibid.*, 9.

⁸ *Ibid.*, 9.

⁹ Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6212.01A, *Compatibility, Interoperability, and Integration of Command, Control, Communications, and Intelligence Systems*, June 1995, A-3.

¹⁰ *Ibid.*, A-2.

¹¹ *Ibid.*, A-3.

Notes

¹² Richard Mallion, “Interoperability: Theory and Practice in JTC3A” in *Control of Joint Forces: A New Perspective*, ed. LtGen Clarence E. McKnight (Fairfax, Va: AFCEA International Press, October 1989), 231.

¹³ *Joint Vision 2010*, 3-14.

Chapter 2

Historical Perspective of Interoperability Problems

Interoperability is the critical enabler, and its has become more and more elusive with time.

—Emmet Paige, Jr.

Causes of Noninteroperability

Interoperability, or the lack thereof, is a complex combination of factors including planning, doctrine, tactics, techniques, and procedures (TTP) and hardware.¹ The most easily quantified (but not necessarily solved) is in the area of hardware. Norman Augustine identified three broad reasons for hardware noninteroperability: active intent, neglect and consent.² Active intent involves purposefully building a system so as not to be interoperable with another, as is often done in the commercial world to maintain product loyalty. Neglect, whereby a system developer fails to consider the requirement to interoperate with another is becoming rare in light of the increasing emphasis on joint operations. The third area, consent, is willful acceptance of noninteroperability to some degree as a design tradeoff.

Consensual Reasons for Hardware Noninteroperability

This is the most relevant and interesting category for this analysis, and Augustine attributes consent to seven underlying reasons:

1. Different hardware, operating in different environments, will often have legitimate requirements, with resultant implications for interoperating with other systems;
2. Administrative convenience based on an organization's requirement to avoid dependency on another;
3. Heritage, the requirement for a new system to remain interoperable with its predecessors or with an large, existing stockpile of a consumable supply for it (ammunition, for example);
4. Costs driven by developing a single system to meet too many varying requirements resulting in the cost of the new, "do-it-all" system as great or greater than specialized systems for various functions;
5. Schedule incompatibility, the introduction of new equipment by different forces or components at different times, based on the obsolescence of previous equipment and requirements for new capabilities;
6. Technical incompatibility, the specific problem of detailed system components interfering in interoperability and;
7. Political, the "least virtuous reason for noninteroperability," attributed to varying political pressures such as ensuring that a system has subcontractors in all 50 states or a contractor pushing his component on the developer.³

Perspectives Drive Doctrine and Tactics, Techniques and Procedures

As intractable and frustrating as the aforementioned causes of hardware noninteroperability appear to be, they are more quantifiable than noninteroperability in doctrine and TTP. In these areas, the perceptions and perspectives of various participants, ingrained over years of training and specialization, shape their response to a given problem.

One of the most demonstrable and relevant examples for this analysis is the use of airpower. Throughout its history, the US Air Force and its predecessors have argued the preeminence of airpower as a unique and decisive form of warfare. "Air doctrine is a blueprint for concepts of warfare inherently different from surface maneuver doctrine."⁴ The "airman's perspective" is contrasted to the Naval and Army perspective of the use of airpower in support of a naval, littoral or land campaign. "Cultural" differences can lead to interoperability problems that reduce the synergism in a joint effort, adversely affecting

mission accomplishment. This institutional heritage and doctrinal prejudice is the most challenging cause of noninteroperability and appears to be the true target of *JV 2010*.

JV 2010 is the latest in a series of steps taken by the CJCS to address these causes of noninteroperability. The ability of the CJCS to affect change in this area and accelerate the progression of joint forces up the interoperability hierarchy has been facilitated most significantly by the 1986 Defense Reorganization Act, or as it is better known, the Goldwater-Nichols Act.

Goldwater-Nichols Sets the Stage

Representative Bill Nichols remarked after passage of the Goldwater-Nichols Act (GN) that Congress, after rejecting President Eisenhower's appeals for unifying forces in the 1950s, could "36 years later...report: mission accomplished."⁵

The extent to which he and Senator Barry Goldwater "accomplished the mission" of unifying joint force organization remains a subject of debate ten years after this hallmark legislation was enacted. What is not debatable is that the GN significantly enhanced the power and role of the CJCS, the Joint Staff and the combatant commanders in this unifying effort.

Results

GN certainly has contributed to improved interoperability and joint effectiveness. In fact, General Shalikashvili points out that "the effects of Goldwater-Nichols have been so imbedded in the military that many members of the Armed Forces no longer remember the organizational problems that brought about this law."⁶ By increasing the CJCS' and CINCs' role in the Planning, Programming and Budgeting System (PPBS) (supported by

an increasingly more powerful Joint Requirements Oversight Council (JROC)) and in the development of joint doctrine, the law directly addresses each of the two broad categories of the causes of noninteroperability: consensual tradeoffs in systems acquisition and varying service perspectives shaping doctrine and TTP.

Drawbacks and Limitations

Critics complain that GN went too far in consolidating power in the joint hierarchy at the expense of the services or, alternatively, that its limitations prevented it from going far enough.

General Carl Mundy, former Commandant of the Marine Corps, urges four cautions for the new generation of joint commanders not present at the initiation of the GN reforms:

1. Effective joint warfighting is the “blending of the distinct colors of the services into a rainbow of synergistic military effectiveness” vice “mixing them until they lose their individual properties.”⁷
2. Concern over the creep of the Joint Staff into resource allocation, hamstringing the services in their lawful role of building forces.
3. Preserving the JCS as a forum for debate and reasoned advice for the NCA, avoiding becoming the Chairman’s one-man show.
4. Cautions against the Joint Staff becoming a general staff.⁸

By strengthening the Chairman and the Joint Staff, there is concern that the role of the services in requirements definition and systems acquisition have been diminished too far. These concerns are focused on the increasingly powerful JROC, whose role has developed more as a secondary effect of GN. The JROC, consisting of the vice service chiefs and chaired by Vice Chairman, Joint Chiefs of Staff (VCJCS), is responsible for evaluating service and CINC operational requirements for joint validity and for assessing (through the Joint Warfighting Capability Assessments (JWCA)) the overall joint

effectiveness of US forces. “Critics contend that the JROC may be operating beyond the bounds of the Goldwater-Nichols law and that it has produced few meaningful trade-offs in terms of systems canceled despite the enormous amount of time expended.”⁹ Admiral Owens, retired VCJCS, contends that the JROC process should go further. He points to several meaningful tradeoffs and argues that additional resources, used by the services to fund think tanks and assessments, should be consolidated under the JROC umbrella.

Despite the controversy, supporters of GN point to the series of successful operations since its inception, including Operation Desert Storm. However, this operation evidenced a host of interoperability problems, some so intractable they remain today.

Interoperability in Operation Desert Shield/Storm

Operations Desert Shield and Storm were the first instance of a true “information war,” where “*knowledge* came to rival weapons and tactics in importance, giving credence to the notion that an enemy might be brought to its knees principally through destruction and disruption of the means for command and control.”¹⁰ The “information differential” became the decisive factor for the defeat of Iraq.¹¹ But this example of information dominance is not without its limitations and inherent problems. The most glaring caution to drawing lessons from the Desert Storm information war is the relatively permissive environment in which it was waged in terms of the time allowed before actual hostilities and the complete lack of a challenge to Coalition domination of the aerospace environment and, most importantly, electromagnetic spectrum. As Alan D. Campen writes in *The First Information War*:

The strategies and tactics used with such sensational effectiveness in Desert Storm worked well because they were conducted in what Robert Hermann

once called a “free signal environment.” What the outcome might have been had the ether been less than benign, should be a matter for serious inquiry; certainly before new doctrine that rests upon the assumption of bountiful communications is hammered into place.¹²

JV 2010 is the basis for that new doctrine, so the interoperability problems from Desert Storm that continue to plague US and potential coalition forces will impact implementation of *JV 2010*. These problems have been detailed in numerous studies. The most significant, in terms of their lingering presence, are summarized below:

1. Difficulties in integrating joint and coalition forces, from the component command level to the fielded forces, with resultant misunderstandings of basic warfighting philosophy and doctrine resulting in significant lost opportunities for enemy attrition and numerous actual and potential fratricide incidents.¹³¹⁴
2. Air Tasking Order (ATO) development and dissemination hampered by no integrated, automated distribution system capable of reaching all coalition air forces.¹⁵¹⁶
3. Stovepiped intelligence and command information systems, which concentrated on supporting national and theater commanders at the expense of providing timely, crucial information at the tactical level.¹⁷¹⁸
4. Myriad heterogeneous and incompatible communications systems, specifically multi-channel and switched systems,¹⁹²⁰ packet switched data communications,²¹ tactical digital information links (TADIL)²² and single channel radio systems,²³ exacerbated by limited quantities of critical communications assets (i.e. satellite communications (SATCOM)²⁴) and incohesive procedures for spectrum management.²⁵

The first major effort to address these problems in an overall effort to better fuse C2 systems in support of warfighting was the CJCS effort Command, Control, Communications, Computers and Intelligence for the Warfighter (C4IFTW).

C4IFTW

C4IFTW is a vision of total interoperability in a joint and/or combined task force launched by the CJCS in 1992. Under the direction of the Joint Staff's C4 Directorate (J-6), C4IFTW is an ongoing process to create “a fused real time, true representation of the

battlespace—an ability to order, respond and coordinate horizontally and vertically to the degree necessary to prosecute [the Warrior’s] mission in that battlespace.”²⁶

C4IFTW divides the Warrior’s C4I infrastructure into the Warrior Terminal, a tailorable, transportable and rugged workstation familiar to the Warrior; the Warrior’s Battlespace, the area defined by the Warrior’s interests or control and presented to the Warrior through an integrated picture of the ground, air, maritime, space and special operations being conducted; and the Infosphere, the worldwide network of military and commercial communications system providing the information support to the Warrior.²⁷ The nascent version of this network is the Global Command and Control System (GCCS).²⁸

C4IFTW has been thoroughly inculcated into the National Military Strategy, and is supported by DOD policy and joint doctrine. The policy is set forth in DOD Directives 4630.5 and 4630.8 establish the global C4I infrastructure objective, consider all C4I systems in DOD for joint use and requires interoperability and integration be considered from requirements definition and validation throughout the acquisition cycle.²⁹ These directives are implemented in CJCS Instruction 6212.01A which details the process of developing information standards and assessing and certifying interoperability.³⁰ The C4IFTW concept is also codified in Joint Pub 6-0, *Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations*.

Despite all these initiatives, many of interoperability deficiencies highlighted in Desert Storm remain. GCCS offers only a partial solution, as it suffers from a focus at the national-to-theater level.³¹ The two recent exercise examples below are a mere representation of the lack of integration of joint forces experienced in numerous exercises and operations today.

Desert Storm Interoperability Problems Remain

The two examples below of recent joint/combined exercises serve as excellent field laboratories for highlighting continuing interoperability deficiencies, precisely because their primary purpose was to emphasize joint and coalition integration.

All Service Combat Identification Evaluation Team (ASCIET) 1995 & 1996

ASCIET is a multiservice organization chartered under the JROC to investigate solutions to the problems of combat identification and fratricide. The field evaluations in 1995 and 1996 brought together weapons and C4I systems in a complex littoral environment with a realistic threat to analyze the technologies and TTP to achieve proper identification and engagement of hostile forces while protecting friendly forces. The evaluations were thoroughly instrumented to capture C4I systems interactions.

Many interoperability and C4I problems of Desert Storm continue to be highlighted in these evaluations including incompatibilities in TADILs or various implementations of the Joint Tactical Information Distribution System (JTIDS), bandwidth limitations in switched networks due to interoperability problems between Mobile Subscriber Equipment (MSE) and the Tri-service Tactical Communications (TRI-TAC) family of switches, and severe limitations in the quantity and interoperability of tactical satellite (TACSAT) communications to fuse forces over a littoral area.³²

Some of the specific interoperability problems highlighted in ASCIET 96 include:

Overall joint combat effectiveness was degraded by participants' lack of joint training and knowledge of joint systems doctrine, TTP, and employment capabilities and limitations. JTIDS implementation differences between Navy and Air Force fighters were not fully understood by the air defense commanders. This degraded operational effectiveness of the integrated air defense system (IADS).

Combat identification systems (CIDS) contributions to the tactical picture were significantly degraded due to TADIL-A interoperability problems.

Joint voice connectivity on primary nets was degraded.

ASCIET 96 employed an extensive data link architecture that was required to integrate separate Service systems. JTIDS was the primary data link and distributed tactical information among 24 data link equipped systems. This joint architecture was less successful in sharing information with legacy data link systems (TADIL-A/B) because of various implementation differences and translation requirements.

Many systems were not joint-certified. In particular, the majority of TADIL-J systems that supported ASCIET 96 have not undergone DOD joint certification testing. The result was that unanticipated joint problems surfaced for the first time and required work-arounds to allow for continued operations.

The data link architecture that supported the joint IADS continued to experience known/repeat integration and interoperability anomalies, which resulted in degraded operational effectiveness.³³

ASCIET provides an excellent opportunity to highlight and address these problems.

The example of the marked increase in the number of JTIDS players in the joint datalink architecture between the 1995 and 1996 evaluations resulting in improved datalink reliability and fidelity demonstrates a response by the services to achieve greater interoperability. The experience of actual operators coupled with the vast amount of collected data offer unique opportunities to discover and resolve interoperability problems, as evidenced by the Joint Integrated Air Defense System Interoperability Working Group formed after ASCIET 96.³⁴

ASCIET, however, also highlights a concern. It serves as a testbed for new combat identification, Identification Friend or Foe (IFF), and C4I systems resulting in the demonstration of a host of promising solutions for properly identifying ground forces to preclude fratricide by air-to-ground attack or other ground forces include SABER,

COBRA, ATHS-II, SADL, EPLRS and others (see Glossary). The Navy's Cooperative Engagement Capability (CEC) has been effectively demonstrated and offers a tremendous potential to fuse air defense sensors for dramatically improved protection against air breathing and ballistic missile threats. The concern arises in the potential development of all these various systems by different services resulting in a whole new gamut of interoperability problems.

Combined Joint Task Force Exercise/Purple Star 1996

CJTFFEX 96 (referred to as Purple Star 96 in US/UK planning) was a large combined/joint exercise conducted along the US southeastern littoral and inland bases by involving over 53,000 personnel from the US and UK between April and May 1996.³⁵

Coalition and joint interoperability problems were again repeated from Desert Storm including lack of sufficient, interoperable radios and lack of secure IFF capability on UK aircraft. Additionally, the architecture to support dissemination of the ATO via the Contingency Theater Automated Planning System (CTAPS) strained multichannel and ground mobile force (GMF) SATCOM capability. The CTAPS network itself, while improving on ATO dissemination over its Desert Storm predecessor Computer Assisted Force Management System (CAFMS), was not responsive nor well integrated among US and UK participating aircraft units, causing again many workaround and less than optimal solutions for distributing the ATO. The Joint Communications-Electronics Operating Instruction (JCEOI), while created with the automated tools developed during Desert Storm, lacked the appropriate coordination to effectively manage and distribute radio frequencies. Finally, integration and training level on joint and combined amphibious doctrine was insufficient resulting in delay and confusion in the buildup of forces ashore.³⁶

These examples point out that due to legacy systems and a lack of consistent joint and combined training, interoperability problems remain some five years after Desert Storm. Many of the newer systems highlighted in these more recent exercises will be fielded and in-place in 2010. Therefore, the Joint Force of 2010 is already developing and the seeds for potential interoperability problems in that force may have already been planted. While GN and C4IFTW set a framework for achieving greater interoperability, *JV 2010* gives insight into the levels of integration required for the Joint Force of 2010 to be effective in joint operations across the full spectrum of operations. Examination of *JV 2010* and its supporting service visions will highlight the requirements for even greater C4I systems and doctrinal interoperability.

Notes

¹ Charles E. McKnight, "Solving the Interoperability Problem" in *Principles of Command and Control*, ed. Jon L. Boyles and Stephen J. Andriole (Washington, DC: AFCEA International Press, 1987), 382.

² This section follows Norman R. Augustine, "The Causes of Noninteroperability" in *Control of Joint Forces: A New Perspective*, ed. LtGen Clarence E. McKnight (Fairfax, Va: AFCEA International Press, October 1989), 227-230.

³ Ibid., 229.

⁴ Rebecca Grant, "Closing the Doctrine Gap," *Air Force Magazine*, January, 1997, 50.

⁵ James R. Locher, "Taking Stock of Goldwater-Nichols," *Joint Forces Quarterly* no. 13 (Autumn 1996): 17.

⁶ John M. Shalikashvili, "A Word From the Chairman," *Joint Forces Quarterly* no. 13 (Autumn 1996): 1.

⁷ General Carl E. Mundy, USMC (Ret), "Cautions on Goldwater-Nichols" *Joint Forces Quarterly* no. 13 (Autumn 1996): 21.

⁸ Ibid., 21.

⁹ Robert Holzer, "Is JROC Poised to Sieze Power?" *Defense News*, 9-15 December 1996.

¹⁰ Alan D. Campen, ed. "Introduction" to *The First Information War* (Fairfax, Va: AFCEA International Press, October 1992), x.

¹¹ Ibid., xi.

¹² Ibid., xi.

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Chapter 3

Interoperability and Joint Force 2010

Joint Vision 2010 provides an operationally based template for the evolution of the Armed Forces for a challenging and uncertain future. It must become a benchmark for Service and Unified Command Visions.

—John M. Shalikashvili

Joint Vision 2010

As stated above, *JV 2010* is a “conceptual template.” It is the CJCS vision future joint warfighting capabilities to achieve *full spectrum dominance*, the capability “to dominate the full range of military operations from humanitarian assistance, through peace operations, up to and into the highest intensity conflict.”¹ This capability is based on four operational concepts (defined in the Glossary): *dominant maneuver, precision engagement, full dimension protection, and focused logistics.*² These are new, powerful concepts are enabled by *information superiority*, “the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary’s ability to do the same, enabled by enhanced C2, fused all source intelligence, dominant battlespace awareness, offensive and defensive information warfare (IW).”³ The promulgation and realization of this vision is dependent upon and has tremendous implications for joint force interoperability.



Figure 1. Joint Vision 2010 Operational Concepts

The interoperability implications of these concepts on Joint Force 2010 are presented below.

Joint Force 2010 Operational Concepts and Interoperability

Information Superiority. As the key enabler of these concepts, Information Superiority will require that the “information differential” discussed for Desert Storm be significantly widened against any future adversary. This will require offensive information warfare to manipulate the adversary’s information systems into deceiving him as well as protecting our information systems from the adversary. Additionally, our information systems must be protected from the internal frictions caused by noninteroperability.

Information Superiority will rely on fused all-source intelligence and enhanced C2 to produce dominant battlespace awareness.⁴ Each of these elements have tremendous interoperability implications. Intelligence systems must become responsive from the NCA all the way to the tactical unit. C2 and intelligence systems can no longer be service unique. All battlespace units and elements must report their locations accurately to allow for perfect friendly positions to be known to all participants. Considering the extent to which a seamless C4I architecture is required, it will be necessary for interoperability to

approach commonality. Information superiority will require integration vice mere interoperability.

Dominant Maneuver. This tenet will depend on dominant battlespace awareness enabled by information superiority. The 21st battlespace must and will be non-linear. Maneuver forces, land, sea, and air and space based will not be able to rely on demarcations of close, rear and deep portions of battlespace. Control measures currently codified in doctrine, such as the Fire Support Coordination Line (FSCL) and the Deep Battle Synchronization Line (DBSL), which exists to make various elements of the joint force compatible will be inappropriate. All friendly units, US and Coalition, must accurately report their location and identification over a fused network to avoid fratricide. In order to rapidly and effectively deploy and employ, the JFC will need a more effective and responsive force phasing and deployment planning over current Time Phased Force Deployment Data systems.

Precision Engagement. As in the case of dominant maneuver, the Joint Force will require precise enemy and friendly locations to target weapons and prevent fratricide. “Real-time sensor-to-shooter responsiveness” from systems such as the Joint Surveillance Target Attack Radar System (JSTARS) must be available across the entire Joint Force regardless of service.⁵

The JFC must be able to effectively plan for and disseminate the plan for employment of engagement forces. The ATO of 2010 must be developed in a more responsive, seamless fashion and rapidly disseminated to all shooter platforms.

Full Dimension Protection. To ensure protection from the two primary threats to the Joint Forces, the enemy and the force itself, C4ISR systems must provide “precise

discrimination between friend and foe.”⁶ The enemy will target our force asymmetrically and seek to exploit seams in the force between the protection offered by individual service systems. To prevent this the JFC must deploy an integrated “joint protection architecture,”⁷ where various force protection systems (theater missile defense, anti-terrorists and local security, environmental protection) are deployed for optimum protection of the entire joint force.

Focused Logistics. Joint Force 2010 will require completely interoperable asset management and in-transit visibility systems between the services, the Defense Logistics Agency and commercial vendors. The revolutionary developments in the commercial sector, which are beginning to be adopted by the military, such as just-in-time delivery must be thoroughly inculcated and institutionalized in the various combat service support C2 systems.

The interoperability implications of these operational concepts are tremendous. Implementation of *JV 2010* will require a cohesive effort on the part of all the services. Examination of the service perspectives captured in the four service visions derives potential disconnects and interoperability issues. *JV 2010* is supported by the four service visions:

1. *Army Vision 2010*
2. *Forward...From the Sea*
3. *Operational Maneuver From the Sea*
4. *Global Engagement.*

Interoperability of the Visions

Each of these visions examine the strategic environment and the potential roles of the US military and that service across the spectrum of conflict in 2010. The emphasis is on a

more disorganized, chaotic world with many types of threats and the requirement for many types of missions from humanitarian assistance and other peace operations through major regional contingency. The Army and Marine visions highlight the rising importance of the Pacific Rim as a region of increasing economic and therefore strategic interest. The Navy and Marine visions highlight the concentration of the world population, commerce and, therefore, potential hotspots, in the littoral areas. The Marine and Air Force visions seem to be at odds on the extent to which 21st Century information superiority will reign in the battlespace. *Global Engagement (GE)* claims that in the “21st century it will possible to find, fix, or track and target anything that moves on the surface of the earth”⁸ while General Krulak, in an article amplifying *Operational Maneuver From the Sea (OMFTS)*, contends that “the 21st Century still will have its share of Clausewitzian ‘fog’ for all warriors.”⁹

Each service vision then goes on to discuss that service’s core competencies and contributions to the joint warfighting effort. While its appropriate for each service vision to set a course for that service’s individual contribution to the Joint Force, each vision, to varying degrees, sought to portray its contribution as *the* decisive element of the Joint Force 2010. The Army and Air Force visions seemed to be offering competing alternatives to the JFC for achieving his operational objectives: direct control over land and resources or rapid global engagement from air and space. The Navy and Marine Corps visions assume the preeminence of the littorals and forward naval presence there as prerequisites to joint operations, thereby installing themselves as the key enablers to joint operations.

As General Mundy stated, it is appropriate and desirable that each service vision emphasize the color of its own operational expertise to provide the most effective blending for the JFC, but the visions, as reviewed below, seek to impose on the JFC of 2010 their own conditions and expectations for employment. This is important in that the perspective shapes the doctrine, training, and materiel (including C4I) development of that service.

Service Visions

Army Vision 2010

Army Vision 2010 (AV 2010) “focuses on the implications of that environment for the fundamental competency the Army contributes to joint operations—the ability to conduct prompt and sustained operations on land throughout the entire spectrum of conflict.”¹⁰ The vision is based on the assertion that “the contribution of land forces to the joint warfight is the power to exercise direct, continuing, and comprehensive control over land, its resources, and its peoples” which “allows land power to make permanent the otherwise transitory advantage achieved by air and naval forces.”¹¹

AV 2010, while contending emphasizing the role of land forces in a joint operations at the same time offers them as the alternative to the other elements of the Joint Force:

With the end of the Cold War, a prominent theory arose that there would no longer be a need for large land forces, that power projection and national military strategy could primarily be carried out through precision strikes using technologically advanced air and naval forces. This “standoff” approach would reduce the level of US involvement and commitment and the requirement for large land forces. Reality proved that theory to be invalid.¹²

Land forces' role is seen as increasing due to their sustained presence, the fact that they constitute the largest part of the joint forces, they are most representative of US international credibility and they are the "most suitable for supporting the military's contribution to peacetime engagement."¹³

AV 2010 maps the four operational concepts of *JV 2010* to five "patterns of operation: Project the Force, Protect the Force, Shape the Battlespace, Decisive Operations, Sustain the Force, and Gain Information Dominance."¹⁴ *AV 2010* generally aligns these patterns with *JV 2010*, but makes particular claims in the areas of Dominant Maneuver and Precision Engagement.

With respect to Dominant Maneuver, *AV 2010* states that "significant advances in avionics, weaponry, vehicle mobility, stealth, survivability, and communication technologies will make the land force truly the force of decisions on the 21st Century battlefield."¹⁵ Precision Engagement is couched in terms of shaping the battlespace, co-opting the *JV 2010* concept into a land force construct: "For land forces, shaping the battlespace is far more than precision strike which, as a lone function, is nothing more than 21st Century attrition warfare."¹⁶

In conclusion, *AV 2010* highlights its duality of attempting to link to *JV 2010* and at the same time, championing the role of land forces. "We are committed to forging that Army - to conduct prompt and sustained operations on land throughout the entire spectrum of crisis, AND to do what needs to be done as part of the joint warfighting team envisioned in *Joint Vision 2010*."¹⁷

Forward...From the Sea

Forward...From the Sea (FFTS) is based on the presumption of US interests relying on maritime power and forward naval presence. “Because we are a maritime nation, our security strategy is necessarily a transoceanic one. Our vital interests are at the endpoint of ‘highways of the seas’ or lines of strategic approach that stretch from the United states to the farthest points on the globe.”¹⁸

FFTS, by invoking the basic organizational building blocks of naval forward presence and power projections forces (“*Aircraft Carrier Battle Groups*—with versatile, multipurpose, naval tactical aviation wings— and *Amphibious Ready Groups*— with special operations-capable Marine Expeditionary Units”¹⁹), proscribe for the JFC the use of these forces as the initial enablers of joint force operations, with Army and Air Force operations to follow.

Forward deployed naval forces will provide the critical operational linkages between peacetime operations and the initial requirements of a developing crisis or major regional security.

Such a massing of naval units can be complemented by the deployment of Army and Air Force units to provide a joint force capable of the full range of combat operations that may be required.²⁰

FFTS cites the inherent flexibility of sea-based forces and freedom of political encumbrances that affect land forces as their unique contribution to the joint force. *FFTS* highlights Marine Air-Ground Task Forces (MAGTF) as microcosms of the joint force they enable: “MAGTFs are the model for joint air-ground task forces evolving as conflicts grow smaller and the forces available grow fewer.”²¹

FFTS, in the same way as the other visions, allows for the JFC of 2010 to choose other forces if called for. “No single military service embodies all of the capabilities

needed to respond to every situation and threat. Our national strategy calls for the individual services to operate jointly to ensure both that we can operate successfully in all warfare areas and that we can apply our military power across the spectrum of foreseeable situations—in peace, crisis, regional conflict, and the subsequent restoration of peace.”²² FFTS’ contribution to the JFC of 2010 are Naval Expeditionary Forces (NEF): “shaped for joint operations, tailored for national needs, and operating Forward...From The Sea.”²³

Operational Maneuver From the Sea

OMFTS builds on *FFTS* to emphasize the projection of naval force ashore into the world's chaotic littorals for operations across the spectrum. *OMFTS* emphasizes Dominant Maneuver across the littoral aimed at enemy centers of gravity supported by the other pillars of *JV 2010*. “What distinguishes *OMFTS* from all other species of operational maneuver is the extensive use of the sea as a means of gaining advantage, an avenue for friendly movement that is simultaneously a barrier to the enemy and a means of avoiding disadvantageous engagements.”²⁴

OMFTS is built on a naval heritage, but must be interrogated into and integrate forces from the entire joint force. The *OMFTS* document describes its heritage:

Just as a littoral is formed by the meeting of land and sea, *OMFTS* is a marriage between maneuver warfare and naval warfare. From maneuver warfare comes an understanding of the dynamic nature of conflict, the imperative of decisive objectives, and the requirement for skillful operations executed at a high tempo. From naval warfare are derived a deep appreciation for the strategic level of war, the advantages inherent in sea-borne movement, and the flexibility provided by sea-based logistics.²⁵

General Krulak, while establishing a vision for Navy and Marine Corps forces, seeks to emphasize *OMFTS* as a joint concept, not the exclusive domain of naval forces. “Our

forces need more than just multi-role platforms; we need multi-role organizations,...our forces and resources [must] become interchangeable to create synergy's of combat power. The OMFTS force will be fully integrated into the joint force, sharing information with all players. "²⁶

Global Engagement

Global Engagement (*GE*) confronts the JFC of 2010 with the proposition that success, as defined by "Full Spectrum Dominance, depends on the inherent strengths of modern air and space power—speed, global range, flexibility, precision, lethality, global/theater situation awareness and strategic perspective."²⁷ The importance of these media will grow: "Operations that now focus on air, land and sea will ultimately evolve into space."²⁸

GE presents the Air Force core competencies of Air and Space Superiority, Global Attack, Rapid Global Mobility, Precision Engagement, Information Superiority, and Agile Combat Support as unique, not in their own right, but through the "speed, flexibility, and the global nature of [the] reach and perspective of [their] execution."²⁹ But *GE*, like the other visions, is careful to couch the service contribution in joint terms:

The first quarter of the 21st Century will demand that the Joint Force Commander field robust, flexible capabilities to cope with a wide range of contingencies. Each military service must present to the combatant commander a set of relevant and complementary capabilities. This presentation allows the JFC to consider all the options available, and tailor campaign plans to best meet the military objectives of the mission.³⁰

In order to stimulate innovation in a number of air and space power mission areas, *GE* delineates a plan for the Air Force to develop battle labs and form, along with the other services, Joint Centers of Excellence for RDT&E.³¹

Service Visions Affect Interoperability

This is an example of the necessary focus as each service strives to fulfill its vision. Each of the services have introduced battle labs and experimentation in order to develop and refine the operational concepts specific to their warfare medium. The efforts of these battle labs, warfighting experiments and Advanced Technology Concept Demonstrations (ATCD) will shape the operational doctrine, TTP, weapons and C2 systems of these services in response to their individual vision and *JV 2010*. Joint efforts at experimentation, similar to the Army and Marine Corps cooperation on Task Force XXI and the Commandant's Warfighting Laboratory, will be critical to all the services fulfilling, not just their own service vision, but the overall *JV 2010*.

The services must avoid clinging to their visions as justification for the ill-conceived reasons for interoperability discussed earlier: administrative convenience, heritage, politics and perspective too closely held. The pressure of reduced budgets and force structure and the reviews that derive these results, such as the Quadrennial Defense Review, must not cloud the services judgment in providing their best expertise and effort, not alone or as a "first among equals,"³² but as a genuinely integrated member of a joint team.

Notes

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¹⁰ Department of the Army, "Introduction," *Army Vision 2010*, Date of Pub, n.p.; online, Internet, 11 January 1997, <http://www.army.mil/2010/>

¹¹ Ibid.

¹² "The Geostrategic Environment and Its Implications for Land Forces," *Army Vision 2010*.

¹³ Ibid.

¹⁴ "The Way Ahead," *Army Vision 2010*.

¹⁵ "Dominant Maneuver," *Army Vision 2010*.

¹⁶ "Precision Engagement," *Army Vision 2010*.

¹⁷ "Conclusion," *Army Vision 2010*.

¹⁸ Department of the Navy, *Forward . . . From the Sea*, (Washington, DC: Department of the Navy, 1994), 2.

¹⁹ Ibid., 4.

²⁰ Ibid., 5.

²¹ Ibid., 8.

²² Ibid., 7.

²³ Ibid., 8.

²⁴ US Marine Corps, "Operational Maneuver From the Sea," *Marine Corps Gazette* 17, no. 6 (June 1996), A-3.

²⁵ Ibid., A-6.

²⁶ Krulak, 28-29.

²⁷ "Air and Space Power for the Next Century," *Global Engagement*.

²⁸ Ibid.

²⁹ "Core Competencies," *Global Engagement*.

³⁰ Ibid.

³¹ "Core Competencies" & "Key Elements of Air Force Infrastructure," *Global Engagement*.

³² John A. Tirpak, "Future Engagement," *Air Force Magazine*, (January, 1997), 20.

Chapter 4

Fulfilling *Joint Vision 2010*

We must proceed with implementing Joint Vision 2010 in a way that captures the promise of these new concepts while sustaining our readiness and flexibility through every step of this evolution.

—*Joint Vision 2010*

JV 2010 calls for greater unification and integration of the individual Service capabilities. The process begun in GN and carried through Desert Storm must be carried to the next level. General Sheehan, CINCUSACOM, charged with being the primary joint force integrator, trainer and provider, describes this effort as Joint Force Integration (JFI).

Joint Force Integration

General Sheehan describes JFI as the progression from “specialized” joint operations of Desert Storm, through “synergistic” joint operations today to the desired end state of “coherent” joint operations envisioned by *JV 2010*.¹ “Synergistic” joint operations involved massed, redundant forces to provide necessary capabilities with various service capabilities merely deconflicted at the joint level (with varying measures of success). Today’s joint force is nearly capable of “synergistic” joint warfare whereby the JFC “orchestrates separate service capabilities for common tactical objectives.”² *JV 2010* requires that future joint forces “accommodate the natural battle rhythms and cycles of

land, sea and air warfare” to conduct ‘coherent’ joint operations: the “integrat[ion of] service capabilities to achieve common tactical and operational objectives.”³

The ability to achieve this coherent level of joint operations will rely on further development of common joint doctrine and on improvements in joint interoperability.

General Sheehan describes this interoperability challenge:

JFI requires the complete interoperability of weapons as well as C4ISR systems. Due to limited procurement funding and resiliency of legacy systems the lack of interoperability remains a major obstacle to JFI. Many interoperability problems encountered in the Gulf War endure. As a key element, JFI seeks to minimize problems caused by legacy systems while moving toward an efficient and responsive battlefield C4ISR architecture with ‘plug and fight’ systems.”⁴

Coherent JFI is the standard of joint force interoperability required to fulfill the goal of *JV 2010*. The vision lays out five areas for implementation: doctrine, education, training, organization, materiel.⁵ Within these areas, the following interoperability recommendations are presented for achieving the vision.

Recommendations

Doctrine

In the area of doctrine, the use and familiarity of joint doctrine initiated with the pivotal role of the CJCS as a result of GN, with must be increased. As the service visions highlighted, each service will continue to identify itself with its primary warfighting medium while seeking to demonstrate how it contributes to a joint effort. *JV 2010* demands an even greater recognition that, while the individual services will continue to provide unique contributions to the joint force, those contributions must be seamlessly coherent and complementary.

This will require that individual service doctrines move closer to supporting joint doctrine and that joint doctrine incorporate and institutionalize the operational concepts of *JV 2010*. Joint doctrine can no longer be used as a control mechanism to deconflict joint forces (such as the use of the FSCL and associated deconfliction means for air and land-based strike systems). Joint doctrine and TTP must become what all services train to and use to integrate their capabilities.

The basic doctrinal differences that still exists as we head into the 21st Century need yet to be resolved. The doctrine must resolve the question of whether or not we can achieve Dominant Battlespace Awareness of all friendly and enemy locations and can conduct Precision Engagement and Dominant Maneuver accordingly, or whether, despite our efforts at Information Superiority, the battlespace remains chaotic. The joint force in 2010 must remain wary and steeled for asymmetric attacks against its information dominance and ensure that training and education continues to instill in subordinate leaders the ability to react in confusing situations with limited information.

Education and Training

This training and education process must start early on in a warfighter's development to inculcate the idea of fighting as a joint team. While the individual services' ethos and heritage must remain to instill esprit and fighting spirit, training for all members from the start of their careers must include an introduction to the capabilities of the joint force overall and their place in it. This training, commenced early in the warfighter's career will ensure that that operator is an expert in his or her service medium and area of expertise, but will avoid building up service paradigms that resist joint operations and hinder interoperability today.

Training as joint force should be increased. The example of USACOM efforts starting in JTF 95 and continuing with JTFEX's for each departing carrier battle-group and ARG/MEU should be extended and expanded to include other deployable joint forces of varying sizes. Most joint exercise participants today are brought together by chance and may or not be the forces that will actually serve alongside in a contingency. All training above the most basic unit level training should emphasize joint interoperability and should attempt to interface with the actual joint units expected. The FORSCOM Joint System Training Exercises (JSTE) are a good example of joint interoperability training, but unfortunately the units included in any given exercise have no relation beyond that exercise.

This joint training effort can be facilitated through the already ongoing efforts to link various service training and simulations centers. The USACOM Joint Battle Center in the Joint Training and Simulation Center represents a focal point that all service training and simulation efforts can be orchestrated around.

Organization

Greater interoperability can be achieved through organizational changes that facilitate the training environment required to hammer out doctrinal differences. Admiral Owens proposes Standing Joint Task Commands that would train together continually⁶ and, through the daily implementation of joint doctrine, break down barriers to interoperability. This is again a significant widening of the USACOM JTFEX program linking MEUs and CVBG with other joint forces into deployable or contingency packages.

This organizational innovation is an extension of the current practice of establishing standing joint task force command elements at various service component and subordinate

command levels (numbered fleets and air forces, Army Corps and Marine Expeditionary Force headquarters). In the same way that establishing these headquarters and cross-assigning other service representatives increases their responsiveness as JTF headquarters, as attested to by USCINCPAC, Admiral Prueher,⁷ the establishment and training of the entire JTF will facilitate interoperability at all levels. This establishment and associated training should also include interagency representation from other government and, as much as feasible, non-government organizations.

This regular, organizationally instituted joint task force structure is required to truly root out interoperability problems and to facilitate training and interoperability with potential allies. As indicated in many examples earlier in this paper, systems which were espoused as interoperable or were fielded by different services under the some overarching banner of interoperability (e.g. JTIDS) may in fact continue to have interoperability problems only realizable by their combination in real-world operational training. Standing Joint Forces would allow this thorough ringing out of interoperability problems, both technical and attitudinal. It is only through this close integration will a JTF be able to master the demanding and highly coherent operational concepts of *JV 2010*.

Admiral Owens suggests the consolidation of the services' efforts in logistics, intelligence, communications, and medial support. Owens points to the considerable cost savings to realized in reduced redundancy in infrastructure.⁸ Greater interoperability in these areas, most significantly communications, would also accrue. These benefits must be weighed against affect the consolidation would have on the ability of the services to provide effective warfighting tools to the JFC if they do not "own" these areas in daily training.

Materiel

The role of the JWCA as an “honest broker” in the systems acquisition and resources area must continue. However, the JWCA process should capitalize on the effort and innovation of the various service battle laboratories. Through coordinating the efforts of the battle labs and sharing the information, greater potential joint impact will be realized by the experiments and the prospect of joint interoperability from the initiation of a concept will be increased.

Additionally, the JWCA and JROC should mandate more commonality of C4ISR systems. The current review process for C4ISR requirements, as described in CJCSI 6212.01A and the Joint Interoperability and Engineering Organization (JIEO) and Joint Interoperability Test Command (JITC) Circular 9002, relies on assessments and certification of interoperability.⁹ Mandates to either use a common item or software or, at least, mandates for interoperable implementation of a standard would greatly improve interoperability. The examples earlier of JTIDS and TRI-TAC show the affect of how varying implementations of a standard limit interoperability at the tactical level, as compared to the interoperability achieved at the higher command echelons by all elements using the common GCCS environment. The newly approved Joint Technical Architecture will greatly facilitate interoperability by making mandatory the use of its “set of performance-based, primarily commercial, information processing, transfer, content, format and security standards.”¹⁰ This codifies the advice of Admiral Metcalf, commander of the joint task force that conducted Urgent Fury, the invasion of Grenada, and sparked the effort toward jointness, that in order to “expect the highest probability of communicating, use the same radio.”¹¹

The JTA and JROC mandates for commonality and standards will enhance the interoperability policy noted above and, under the auspices of C4IFTW, should reduce the numbers of C4ISR systems and improve interoperability, but the numbers of systems involved and their legacy may preclude the level of JFI required of *JV 2010*. (Appendix A is the ASD (C3I) list of approved migration systems.) *JV 2010* will require a new realization of how information superiority is the ultimate weapon of the Joint Force of 2010.

While the services need to remain experts in their areas of warfare. Except for the specific cases where their requirements *legitimately* call for different systems, which is rare in C4ISR systems, those systems should be the same. This is the only method to cost-effectively build a worldwide, common infosphere as envisioned in C4IFTW and required by *JV 2010*. DOD has recently embarked on an effort to respond to the C4ISR requirements of *JV 2010* to reshape both the C2 systems and their doctrine and TTP.

Advanced Battlefield Information System

This realization prompted the recent Advanced Battlefield Information System (ABIS) Task Force. The ABIS Task Force considered “three aspects of the warfighting environment: battlespace management, sensor-to-shooter interoperability, and requirements for a common, supporting information architecture.”¹² The ABIS, “the future global systems-of-systems”¹³ will drive science and technology iteratively with developments in operational procedures and doctrine to develop the appropriate C4ISR systems to support *JV 2010*. ABIS envisions as a framework capabilities sets in three layers: effective force employment, battlespace awareness, and a grid of common information services. In describing information superiority, the ABIS study strikes the

proper balance between the Air Force and Marine visions of attempting to “digitize out” the fog of war:

Information superiority ensures that friendly forces have a superior awareness and understanding of the current and projected situation, as well as the commander’s intent, and can deny similar awareness and understanding to the enemy. It also implies that friendly forces can better accommodate uncertainty by applying both knowledge and judgment in a more effective way.

Such a capability provides commanders at all levels a broader perspective of the battlespace, allowing them to be proactive in applying force at the right time and at the right place to shape the battlespace, control the pace and intensity of engagements, and operate within the cycle time of the adversary. Shared perception and common understanding of the situation and the commander’s intent across dispersed force elements facilitate synchronization and responsiveness to changing situations and coordination, or self-synchronization, across the entire force to achieve overwhelming effect. The result is increased speed of command that will be of critical importance in determining combat outcome.¹⁴

This will drive new C2 processes and organization that will reduce the hierarchical structure of the joint force and its division into functional areas. Thus, the Joint Force of 2010 will be truly integrated.

ABIS must be expanded to cover the operational concept of Focused Logistics and its relation to C4IFTW must be clearly documented. In this way it will completely cover the requirements of *JV 2010*, and update, vice replace the architectural framework of C4IFTW.

ABIS, coupled with C4IFTW, JTA and the harnessing of service battle labs with the JWCA will serve to continue the movement of US forces along the spectrum from the compatibility of “specialized” joint force of Desert Storm through the partially interoperable “synergistic” joint force of today to the “coherent” integrated joint force of 2010.

Notes

¹ General John J. Sheehan, "Next Steps in Joint Force Integration," *Joint Forces Quarterly* no. 13 (Autumn 1996): 42.

² Ibid., 42.

³ Ibid., 42.

⁴ Ibid., 44.

⁵ *Joint Vision 2010*, 33.

⁶ Robert Holzer, "Debate Targets Extent of Goldwater-Nichols Review," *Defense News*, December 9-15, 1996.

⁷ Admiral Joseph Prueher, "Warfighting CINCs in a New Era," *Joint Forces Quarterly* no. 13 (Autumn 1996): 49.

⁸ Robert Holzer, "Dabate Targets Extent of Goldwater-Nichols Review," *Defense News*, 9-15 December 1996.

⁹ JIEO/JITC Circular 9002, *Requirements Assessment and Interoperability Certification of C4I and AIS Equipment and Systems*, 23 January 1995.

¹⁰ Paul G. Kaminski and Emmitt Paige, Office of the Secretray of Defense Memonrandum, "Implementation of the DOD Joint Technical Architecture," 22 August 1996.

¹¹ Vice Admiral Metcalf, lecture to the Air Command and Staff College, 31 January 1997.

¹² Anita K. Jones and Vice Admiral Arthur Cebrowski, "ABIS Task Force Report - Executive Summary," Date of Pub, n.p.; on-line, Internet, 1 February 1997, <http://www.dtic.mil/dstp/DSTP/abis/abis.htm>

¹³ Ibid.

¹⁴ Ibid.

Chapter 5

Conclusion

Joint Vision 2010 serves as the basis for focusing the strengths of each individual Service or component to exploit the full array of available capabilities and allow us to achieve full spectrum dominance.

—*Joint Vision 2010*

Interoperability is the lens of *JV 2010*. Despite a history of combined arms operations, the transformation of US forces toward jointness was heralded by the Goldwater-Nichols Act of 1986. This set the framework for the state of joint and combined force interoperability in Desert Storm. Despite much progress from pre-GN, there remained in Desert Storm and today some significant interoperability problems among US forces. These problems lie in both hardware, most importantly C4ISR systems, and in doctrinal perspectives and paradigms. These act as fog on the lens of *JV 2010*.

JV 2010 marks another sea change in joint warfare, much as GN did before it. The vision demands that while each service retain its ethos, character, and expertise, all services must further transform themselves, both in terms of C4ISR systems and doctrinal perspectives, toward greater integration.

This effort must encompass all the existing mechanisms toward interoperable and integrated forces, including C4IFTW, the JROC and JWCA processes focusing the efforts of service battlelabs, GCCS, the JTA and existing interoperability standards, assessment

and certification procedures. Moreover, *JV 2010* demands that the development of C4ISR systems to achieve information superiority be more than just the migration of today's systems, but rather an iterative, cooperative effort between technology development and C2 doctrinal and operational development. The DOD ABIS is focusing mechanism for the C2 interoperability lens of *JV 2010*.

Glossary

ABIS	Advanced Battlefield Information System
ASCIET	All Service Combat Identification Evaluation Team
ATHS-II	Advanced Target Handoff System - II
CEC	Cooperative Engagement Capability
COBRA	Collection of Broadcasts from Remote Assets
CTAPS	Contingency Theater Automated Planning System
DBSL	Deep Battle Synchronization Line
DODIIS	Department of Defense Intelligence Information System
EPLRS	Enhanced Position Locations and Reporting System
FSCL	Fire Support Coordination Line
GCCS	Global Command and Control System
IFF	Identification Friend or Foe
JTIDS	Joint Tactical Information Distribution System
MSE	Mobile Subscriber Equipment
SABER	Situation Awareness Beacon and Reply
SADL	Situation Awareness Data Link
TRI-TAC	Tri-Service Tactical Communications System

Dominant Maneuver. “Dominant maneuver will be the multidimensional application of information, engagement, and mobility capabilities to position and employ widely dispersed joint air, land, sea, and space forces to accomplish the assigned operational tasks. Dominant maneuver will allow our forces to gain a decisive advantage by controlling the breadth, depth, and height of the battlespace. Through a combination of asymmetric leverage, achieved by our positional advantages, as well as decisive speed and tempo, dominant maneuver allows us to apply decisive force.

Focused Logistics. “Focused logistics will be the fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets

even while enroute, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations

Full Dimension Protection. “The primary prerequisite for full-dimensional protection will be control of the battlespace to ensure our forces can maintain freedom of action during deployment, maneuver and engagement, while providing multi-layered defenses for our forces and facilities at all levels. Full-dimensional protection will enable the effective employment of our forces while degrading opportunities for the enemy. It will be essential, in most cases, for gaining and maintaining the initiative required to execute decisive operations

Full Spectrum Dominance. The capability “to dominate the full range of military operations from humanitarian assistance, through peace operations, up to and into the highest intensity conflict

Information Superiority. The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary’s ability to do the same, enabled by enhanced C2, fused all source intelligence, dominant battlespace awareness, offensive and defensive information warfare (IW).

Precision Engagement. “Precision engagement will consist of a system of systems that enables our forces to locate the objective or target, provide responsive command and control, generate the desired effect, assess our level of success, and retain the flexibility to reengage with precision when required. Even from extended ranges, precision engagement will allow us to shape the battlespace, enhancing the protection of our forces

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